

## CLAIMS

1. A magnetic thin film for high frequencies with a multilayered structure, the multilayered structure comprising:
  - a cobalt (Co)-based amorphous alloy layer; and
  - an oxidation layer of the Co-based amorphous alloy,

wherein a volume ratio of the oxidation layer to the whole multilayered structure lies within the range of 5% to 50%.
2. A magnetic thin film for high frequencies with a multilayered structure,  
the multilayered structure comprising:
  - a Co-based amorphous alloy layer having such a characteristic that a direction of a magnetic field applied in a film formation process comes to be a direction of an easy magnetization axis of the Co-based amorphous alloy layer; and
  - an oxidation layer of the Co-based amorphous alloy,

wherein the easy magnetization axis of the whole multilayered structure manufactured is perpendicular to the direction of the magnetic field applied in the film formation process.
3. The magnetic thin film according to claim 1, wherein the Co-based amorphous alloy layer is made of a cobalt-zirconium-niobium (CoZrNb) alloy.
4. The magnetic thin film according to claim 2, wherein the

Co-based amorphous alloy layer is made of a cobalt-zirconium-niobium (CoZrNb) alloy.

5. The magnetic thin film according to claim 1, wherein a value of resistivity is 150  $\mu\Omega\text{cm}$  or more, and a value of anisotropic magnetic field intensity is  $10^5 / 4\pi [\text{A/m}]$  or more.

6. The magnetic thin film according to claim 2, wherein a value of resistivity is 150  $\mu\Omega\text{cm}$  or more, and a value of anisotropic magnetic field intensity is  $10^5 / 4\pi [\text{A/m}]$  or more.

7. The magnetic thin film according to claim 1, wherein a value of ferromagnetic resonance frequency is 2 GHz or more.

8. The magnetic thin film according to claim 2, wherein a value of ferromagnetic resonance frequency is 2 GHz or more.

9. A method of manufacturing a magnetic thin film for high frequencies,

the method comprising a step of forming a multilayered structure under a magnetic field applied, the multilayered structure including a Co-based amorphous alloy layer and an oxidation layer of the Co-based amorphous alloy, so that a volume ratio of the oxidation layer to the whole multilayered structure falls within a range of 5% to 50%.

10. A method of manufacturing a magnetic thin film for high

frequencies comprising a step of alternately repeating a first step and a second step thereby forming a multilayered structure including the Co-based amorphous alloy layer and the oxidation layer thereof, wherein;

in the first step a Co-based amorphous alloy layer is formed under an external magnetic field, the Co-based amorphous alloy layer having such a characteristic that a direction of the external magnetic field applied in a film formation process comes to be a direction of an easy magnetization axis of the Co-based amorphous alloy layer, and

in the second step an oxidation layer of the Co-based amorphous alloy is formed,

whereby the easy magnetization axis of the whole multilayered structure manufactured is perpendicular to the direction of the external magnetic field applied.

11. The method of manufacturing a magnetic thin film according to claim 9, wherein the Co-based amorphous alloy layer is made of a CoZrNb alloy.

12. The method of manufacturing a magnetic thin film according to claim 10, wherein the Co-based amorphous alloy layer is made of a CoZrNb alloy.

13. A magnetic device comprising, as a portion thereof, the magnetic thin film for high frequencies described in claim 1.

14. A magnetic device comprising, as a portion thereof, the magnetic thin film for high frequencies described in claim 2.
15. The magnetic device according to claim 13 further comprising a coil, wherein a pair of the magnetic thin films for high frequencies are provided opposite to each other to sandwich the coil.
16. The magnetic device according to claim 14 further comprising a coil, wherein a pair of the magnetic thin films for high frequencies are provided opposite to each other to sandwich the coil.
17. The magnetic device according to claim 13, wherein the magnetic device is used for an inductor or a transformer.
18. The magnetic device according to claim 14, wherein the magnetic device is used for an inductor or a transformer.
19. The magnetic device according to claim 13, wherein the magnetic device is used for a monolithic microwave integrated circuit.
20. The magnetic device according to claim 14, wherein the magnetic device is used for a monolithic microwave integrated circuit.